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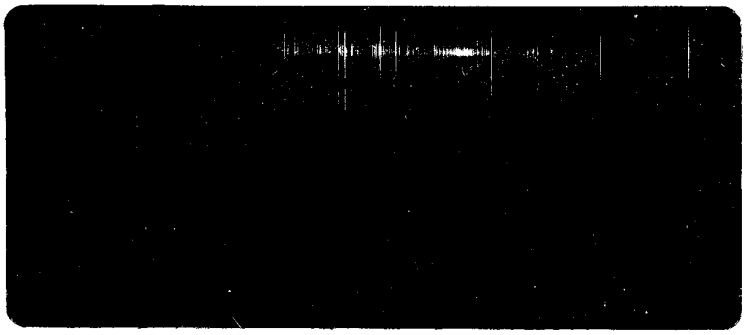

Declass Review by NGA.

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25X1

[redacted]

FY-66 Quarterly Report No. 4

PAR 207
31 May 66

SUBJECT: Definitive Study of Contact Printers

TASK/PROBLEM

1. Conduct a comprehensive evaluation of existing contact printers; i.e., flat bed, step and repeat, and drum platen (continuous types). Primary objective is to determine printers and/or techniques that will provide maximum fidelity of duplication.

DISCUSSION

2. The final report covering effort on the Phase I investigation of techniques and tools for evaluation of contact printers was forwarded to the customer on 6 Apr 66.

PLANNED ACTIVITY

3. None. Publication of the final report constitutes project completion.

Believe we must let them know that we want phase II to be dropped!

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5X1

FY-66 Quarterly Report No. 3

PAR 207
28 Feb 66

SUBJECT: Definitive Study of Contact Printers

TASK/PROBLEM

1. Conduct a comprehensive evaluation of existing contact printers; i.e., flat bed, step and repeat, and drum platen (continuous types). Primary objective is to determine printers and/or techniques that will provide maximum fidelity of duplication.

DISCUSSION

2. The final report covering effort on the Phase I investigation of techniques and tools for evaluation of contact printers is now being reviewed, preparatory to publication.

PLANNED ACTIVITY

3. Publish final report.

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[redacted]

Monthly Report

Wilmf
File 7204

25X1

PAR 207

31 Jan 66

SUBJECT: Definitive Study of Contact Printers

TASK/PROBLEM

1. Conduct a comprehensive evaluation of existing contact printers; i.e., flat bed, step and repeat, and drum platen (continuous types). Primary objective is to determine printers and/or techniques that will provide maximum fidelity of duplication.

DISCUSSION

2. The final report, covering effort on the Phase I investigation of techniques and tools for evaluation of contact printers, is being prepared.

PLANNED ACTIVITY

3. Complete and publish the final report by March 1966.

SECRET

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25X1

Monthly Report

PAR 207
31 Dec 65

SUBJECT: Definitive Study of Contact Printers

TASK/PROBLEM

1. Conduct a comprehensive evaluation of existing contact printers; i.e., flat bed, step and repeat, and drum platen (continuous types). Primary objective is to determine printers and/or techniques that will provide maximum fidelity of duplication.

DISCUSSION

2. The final report, which covers effort expended on the Phase I investigation of techniques and tools to be used for evaluation of contact printers, is being prepared.

PLANNED ACTIVITY

3. Complete and publish final report.

SECRET

GROUP 1
EXCLUDED FROM AUTOMATIC DOWNGRADING AND DECLASSIFICATION

SECRET

5X1

FY-66 Quarterly Report No. 2

PAR 207
30 Nov 65

SUBJECT: Definitive Study of Contact Printers

TASK/PROBLEM

1. Conduct a comprehensive evaluation of existing contact printers; i.e., flat bed, step and repeat, and drum platen (continuous types). Primary objective is to determine printers and/or techniques that will provide maximum fidelity of duplication.

DISCUSSION

2. The final report preparation, covering effort expended on Phase I investigation of techniques and tools to be used for evaluation of contact printers, is in progress.

PLANNED ACTIVITY

3. Complete and publish the final report.

25X1

SECRET

GROUP 1
EXCLUDED FROM AUTOMATIC DOWNGRADNG AND DECLASSIFICATION

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25X1

Monthly Report

PAR 207

29 Oct 65

SUBJECT: Definitive Study of Contact Printers

TASK/PROBLEM

1. Conduct a comprehensive evaluation of existing contact printers; i.e., flat bed, step and repeat, and drum platen (continuous types). Primary objective is to determine printers and/or techniques that will provide maximum fidelity of duplication.

DISCUSSION

2. The final report preparation, covering effort expended on Phase I investigation of techniques and tools to be used for evaluation of contact printers, is in progress.

PLANNED ACTIVITY

3. Complete and publish the final report.

SECRET

SECRET

MONTHLY REPORT

[redacted]

25X1

PAR 207

30 Sept 65

SUBJECT: Definitive Study of Contact Printers

TASK/PROBLEM

1. Conduct a comprehensive evaluation of existing contact printers; i.e., flat bed, step and repeat, and drum platen (continuous types). Primary objective is to determine printers and/or techniques that will provide maximum fidelity of duplication.

DISCUSSION

2. All effort on the approved portion of this PAR (Phase I, the investigation of techniques and tools to be used for evaluation of contact printers) has been completed. The final report preparation is in progress.

PLANNED ACTIVITY

3. Complete and publish the final report.

SECRET

GROUP 1
EXCLUDED FROM AUTOMATIC DOWNGRADING AND DECLASSIFICATION

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25X1

FY-66 Quarterly Report, No. 1

PAR 207
31 Aug 65

SUBJECT: Definitive Study of Contact Printers

TASK/PROBLEM

1. Conduct a comprehensive evaluation of existing contact printers, i.e., flat bed, step and repeat, and drum platen (continuous types). Primary objective is to determine printers and/or techniques that will provide maximum fidelity of duplication.

DISCUSSION

2. Evaluation of microdensitometry of both sharp edge and long-bar resolution target reproductions was accomplished. This completed Phase I experimental effort.

3. To date all effort has been expended on the approved portion of this PAR -- Phase I, the investigation of techniques and tools to be used for evaluation of contact printers.

4. Preparation of the final report was started.

PLANNED ACTIVITY

5. Complete and publish the final report.

SECRET

SECRET

MONTHLY REPORT

[redacted]

25X1

PAR 207
30 Jul 65

SUBJECT: Definitive Study of Contact Printers

TASK/PROBLEM

1. Conduct a comprehensive evaluation of existing contact printers; i.e., flat bed, step and repeat, and drum platen (continuous types). Primary objective is to determine printers and/or techniques that will provide maximum fidelity of duplication.

DISCUSSION

2. Results of study on this program are now being summarized for final reporting. No further experimental effort is in progress, and none will be undertaken unless strong interest is indicated by the customer.

PLANNED ACTIVITIES

3. Complete the final report.

15 Oct
Publication date

SECRET

GROUP 1
EXCLUDED FROM AUTOMATIC DOWNGRADNG AND DECLASSIFICATION

SECRET

MONTHLY REPORT

25X1

PAR 207

30 June 65

SUBJECT: Definitive Study of Contact Printers

TASK/PROBLEM

1. Conduct a comprehensive evaluation of existing contact printers; i.e., flat bed, step and repeat, and drum platen (continuous types). Primary objective is to determine printers and/or techniques that will provide maximum fidelity of duplication.

DISCUSSION

2. Most of the microdensitometry of both sharp edge and long-bar resolution target reproductions has been completed. Evaluation of this experimental work is in progress, and it is hoped no further printing and microdensitometry will be required. Should this be true, as is anticipated, final summing up of all investigations conducted to date can proceed.

PLANNED ACTIVITIES

3. As indicated above, we are close to the point where the Final Report will be the major effort.

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[redacted]

25X1

FY-65 Quarterly Report, No. 4

PAR 207
28 May 65

SUBJECT: Definitive Study of Contact Printers

TASK/PROBLEM

1. Conduct a comprehensive evaluation of existing contact printers, i.e., flat bed, step and repeat, and drum platen (continuous types). Primary objective is to determine printers and/or techniques that will provide maximum fidelity of duplication.

DISCUSSION

2. Operational characteristics and reliability of a sharp edge target, made by soft x-ray exposure of 649GH film, are in the final stages of investigation. Each reproduced edge must first be measured by microdensitometry, with the resultant graphical trace then analyzed geometrically and/or mathematically. Both analytical approaches are under investigation, with the hope that complicated mathematical evaluations can be avoided in a dependable comparative test procedure. While close correlation of the results from any two analytical procedures may not always be expected, it appears that the use of two somewhat different geometric evaluations will facilitate reliable ranking of printer performances.

3. Little experimental work remains in the establishment of procedures for visual resolution determination. Because of its ready availability, the U. S. Air Force Resolution Target, 1951, is one of two which we recommend. Its major shortcoming is that, having a sixth root of two cycle, the line frequency interval between adjacent groups is rather large. A finer graduated target, such as the U. S. Air Force Resolution Target, 1962, which has a twelfth root of two cycle, therefore should be used if available. It is likely that the effect of human judgement discrepancies, and extraneous physical abnormalities will be reduced by the use of the smaller interval target.

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PAR 207
28 May 65

4. Machine readable long bar resolution targets are being established as a third means of evaluating printer performance. Having been unsuccessful in procuring a suitable target reading beyond 260 lines per millimeter, we are basing our evaluation of prints from this type of target on the relative shapes of the microdensitometer traces of the elements from 10 to 260 l/mm. It would be desirable to have a 500 l/mm capability, but the present limitations should not seriously effect a valid ranking of printer performances.

PLANNED ACTIVITIES

5. Experimental effort to establish operational and evaluation procedures for the three systems described should be completed within the next month. Simultaneously, organizational effort for the formal reporting of all phases of the PAR will be in progress.

6. No further investigation of Moire' patterns will be planned or accomplished. This area of study is now regarded as complete with the data given in Quarterly Report No. 3, dated 26 February 65 (and previous reports). Information generated on Moire' patterns will be discussed in the final report.

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MONTHLY REPORT

25X1

PAR 207

3 May 65

SUBJECT: Definitive Study of Contact Printers

TASK/PROBLEM

1. Conduct a comprehensive evaluation of existing contact printers, i.e., flat bed, step and repeat, and drum platen (continuous types). Primary objective is to determine printers and/or techniques that will provide maximum fidelity of duplication.

DISCUSSION

2. A sharp-edge target on 649GH film, exposed by soft X-rays, has been obtained and partially tested. There is a total of 16 edges, consisting of four density levels in each of four directions. Some microdensitometer tracing has been accomplished on both the original target and on duplicates; evaluation of the curves has not yet been formalized. Approximately thirty hours of additional densitometry is planned.

3. Three types of resolution targets are being recommended for inclusion in the PAR 207 Test Procedures: The Air Force Resolution Target, 1951 (short bars, sixth root of two cycle); one form of a twelfth root of two target, such as the Air Force Resolution Target, 1962; and the long-bar CORN Target to be machine-read. Experimental effort is nearly half completed, and will require approximately two additional weeks of uninterrupted attention.

PLANNED ACTIVITIES

4. Upon completion of the additional microdensitometer tracing, the curves generated in the sharp edge study will be evaluated both graphically and mathematically (computer calculation of actuance). It is expected this will complete the sharp edge study experimental effort.

5. Microdensitometry of CORN Target reproductions will continue.

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MONTHLY REPORT

[redacted]

25X1

PAR 207
31 Mar 65

SUBJECT: Definitive Study of Contact Printers

TASK/PROBLEM

1. Conduct a comprehensive evaluation of existing contact printers; i.e., flat bed, step and repeat, and drum platen (continuous types). Primary objective is to determine printers and/or techniques that will provide maximum fidelity of duplication.

DISCUSSION

2. The investigations with the Moire' technique as described in previous reports have concentrated upon adapting the Moire' pattern technique for use with existing printers and determining the sensitivity and repeatability of this system as a distortion measuring tool. The results of these tests indicate that the Moire' pattern technique could be very useful but would require additional investigation to develop the required degree of refinement. Calculations of distortion reported to date have been in terms of an overall average for two perpendicular directions; longitudinal and transverse relative to the film length. These averages were developed from several local distortion measurements for which there is, presently, no straightforward method of presenting results.

3. Recently, a vector description of film distortion has been examined. It appears to be useful for diagrammatic explanations of local distortions and may also possess other worthwhile characteristics depending upon what information is desired concerning distortion.

4. It is now felt the project scope has been satisfied for the investigations of Moire' techniques since the system has been demonstrated as a useful tool and some methods of expressing the results are available.

5. Work has started upon the investigation of tools to measure acutance. Presently, a sharp edge target is being procured for experimentation with continuous and flat bed printers.

PLANNED ACTIVITIES

6. Using a microdensitometer, analyze the results of printing a sharp edge target on a continuous printer.

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QUARTERLY REPORT

[redacted]

25X1

PAR 207
26 Feb 65

SUBJECT: Definitive Study of Contact Printers

TASK/PROBLEM

1. Conduct a comprehensive evaluation of existing contact printers, i.e., flat bed, step and repeat, and drum platen (continuous types). Primary objective is to determine printers and/or techniques that will provide maximum fidelity of duplication.

DISCUSSION

2. Work results already reported this quarter in monthly reports includes:

a. Moire' pattern cancellation points produced using halftone masters of known distortion.

b. Polaroid print record established as a simple and effective method for measuring cancellation points in the patterns.

c. Repeatability of measurement readings was established.

d. Repeatability determined for combined effect of reading, re-registration and other system variations.

e. To accomplish the extensive data handling involved, a computer program was developed to facilitate and expedite distortion calculations.

f. Four briefing aid designs were prepared for customer consideration.

3. Samples of (Type SO-117) film were exposed on a Niagara Printer and analyzed using the Moire' technique to determine distortions. The printing negative was 9.5 inches wide and contained an 11-inch section of halftone grid on Estar support. This grid was printed at the extreme maximum and minimum printer web tensions to produce prints for measuring the distortion difference which results from a change in negative web stress. The raw stock tension was adjusted to a minimum level and remained constant. Also, to

examine the effect of process handling upon distortion, some film samples were tray processed and dried at room temperature; others received the standard process in the Dalton processor.

4. After drying, the half tone prints were registered with a glass reference grid. This registration produced a Moire' pattern from which measurements were made to calculate distortion values. The following table summarizes the test conditions and average distortion values for each sample. It should be noted that the distortion values listed below include a distortion of 0.17 percent contributed by the master grids used.

Sample Number	Printer Tension	Process Method	% Distortion "X" Component	% Distortion "Y" Component
1	High	Dalton	.270	.198
2	High	Dalton	.274	.200
3	High	Dalton	.275	.200
4	High	Tray	.280	.195
5	High	Tray	.281	.201
6	High	Tray	.276	.202
7	High	Tray	.279	.192
8	High	Tray	.281	.208
9	Low	Dalton	.301	.211
10	Low	Dalton	.293	.212
11	Low	Tray	.300	.211
12	Low	Tray	.297	.206
13	Low	Tray	.303	.212

NOTE: "X" Component refers to longitudinal direction on film.
"Y" Component refers to transverse direction on film.

SECRET

5. Analysis of the distortion data has not proceeded beyond the calculation of the averages presented.

PLANNED ACTIVITIES

6. Complete the analysis of existing data and determine need for replication of the tests described above.

SECRET

MONTHLY REPORT

[redacted]

25X1

PAR 207
22 Jan 65

SUBJECT: Definitive Study of Contact Printers

TASK/PROBLEM

1. Conduct a comprehensive evaluation of existing contact printers, i.e., flat bed, step and repeat, and drum platen (continuous types). Primary objective is to determine printers and/or techniques that will provide maximum fidelity of duplication.

DISCUSSION

2. Information is being collected to determine the repeatability of the present distortion measuring system which utilizes the Moire' technique. Using a half-tone grid film print and a glass master half-tone grid having known distortion between them, measurements were made of Moire' patterns produced from nine successive registrations. This operation occurred over a period of approximately three hours. The pattern measurements, made from Polaroid prints, were used to calculate components of distortion at 18 locations on each registration. Analyzing these calculations produced the following results:

a. "X" Component of Test Sample Distortion:
   (1) Average overall distortion = 0.19 percent.
   (2) Range of values from 9 replications at 18 locations:
      (a) Maximum Range 0.007 percent.
      (b) Minimum Range 0.002 percent.
      (c) Average Range 0.005 percent.

b. "Y" Component of Test Sample Distortion:
   (1) Average overall distortion = 0.193 percent.
   (2) Range of values from 9 replications at 18 locations:
      (a) Maximum Range 0.009 percent.
      (b) Minimum Range 0.002 percent.
      (c) Average Range 0.006 percent.

3. The previous report described the variations encountered in making pattern measurements from a Polaroid print. At that time, it was found that variations averaged about 0.003 percent from reading the print. The values stated in this report represent variations from reading the Polaroid print plus any others encountered from re-registration.

4. Four proposed briefing aid designs were prepared for submission to the customer.

PLANNED ACTIVITIES

5. Continue to investigate the repeatability of the system and make the first measurements on distortions produced from a Niagara Printer.

6. Respond to customer guidance on briefing aids.

Monthly Report

[redacted]

25X1

PAR 207
24 Dec 64

SUBJECT: Definitive Study of Contact Printers

TASK/PROBLEM

1. Conduct a comprehensive evaluation of existing contact printers, i.e., flat bed, step and repeat, and drum platen (continuous types). Primary objective is to determine printers and/or techniques that will provide maximum fidelity of duplication.

DISCUSSION

2. To investigate the use of the Moire' technique to determine printer duplicating fidelity, the existence and magnitude of errors inherent in the measuring method, exclusive of a printer, must be known. During this report period, effort was expended in:

a. Designing a method of making measurements of Moire' pattern cancellation points.

b. Determining the repeatability of several readings of the same Moire' pattern cancellation points.

c. Calculating distortion from the several readings of the same Moire' pattern cancellation points.

3. To produce a Moire' pattern, two halftone masters, having known distortion, were sandwiched in a vacuum frame. A grid containing, twenty squares to the inch, was also placed in the vacuum frame. A Polaroid print of the Moire' pattern and grid overlay was made. From this print, the Moire' pattern cancellation points can be located and recorded as grid coordinates. This technique was selected for the following reasons:

a. The measurements are made from a photographic record, as will be the case in actual printer investigations.

b. Once the pattern is formed, it is recorded quickly permitting very little time for changes due to ambient conditions of temperature, humidity, etc.

c. A permanent record is formed.

d. The use of a high contrast print makes locating the cancellation centers easier.

e. Parallax normally encountered from direct reading of the pattern is minimized.

4. The measurements made of the Moire' pattern form the raw data which must be operated upon to calculate the distortion. To perform this job, a computer program has been devised. This program currently calculates the distortion components in the X and Y directions for each pair of adjacent Moire' cancellations. It also computes an average of the local distortions for each test.

5. A Polaroid print of a Moire' pattern was made as outlined in paragraph 3. The print contained twenty-five cancellation points from which eighteen distortion values could be calculated. To determine the accuracy of repeat reading, the X-coordinate of each of the twenty-five cancellation points was read four times by the same experienced technician. This resulted in seventy-two (18 x 4) distortion valves. Based on these results:

a. The average over-all distortion was 0.186 percent.

b. The average range was .003 percent.

c. Assuming random measurement variations, ninety-nine percent of the ranges calculated from repeat readings should fall between 0.000 and .006 percent.

PAR 207
24 Dec 64

PLANNED ACTIVITIES

6. Effort will continue to generate more data on the repeatability of the measuring method, and the ability of the Moire' system to repeat distortion measurements for the same piece of distorted film. Effort may also extend to obtaining the first measurement of distortions from film exposed upon a Niagara printer.

7. Rough drafts will be prepared for proposed briefing aids.

Approved For Release 2005/05/02 : CIA-RDP78B04770A002100100002-7

25X1

PAR 207
30 Nov 64

SUBJECT: Definitive Study of Contact Printers

TASK/PROBLEM

1. Conduct a comprehensive evaluation of existing contact printers, i.e., flat bed, step and repeat, and drum platen (continuous types). Primary objective is to determine printers and/or techniques that will provide maximum fidelity of duplication.

DISCUSSION

2. Image evaluation by such techniques as spread function and modulation transfer function will be investigated as part of this PAR. However, greater current practicality is evident in the direct determination of resolving power. Using the standard Air Force Resolution Target (1951), investigation is in progress to establish the relationship between high contrast, medium contrast and low contrast test objects. Also, the difference between negative and positive type resolution targets and the effect of exposure level on resolution are being studied.

3. Moire' patterns resulting from printed half-tones are being investigated as a means of locating and measuring distortion. Both local and general distortion problems are considered. Using master glass plates as the reference standards, film-base working master halftones have been prepared for actual printing tests. In general, the third-generation halftone prints produced on the printer will be matched against the film-base second-generation masters. Some time has been spent modifying vacuum hold-down equipment and perfecting necessary handling techniques for doing this. Also, means of reproducing the Moire' patterns both manually and photographically were evolved to aid in the precise calculation of distortion magnitudes.

PAR 207
30 Nov 64

4. A review of progress with customer representatives was held on 19 November 1964. Moire' patterns and knife edge test targets were discussed at this review.

PLANNED ACTIVITIES

5. Renewed effort to obtain satisfactory test objects for acutance determinations will be started shortly. Work described in paragraphs 2. and 3. above will continue as concurrent effort.

6. Rough draft sketches of proposed briefing aids will be made and forwarded to the customer.

Attachment #5

Misc - 56
21 Nov 64

25X1 SUBJECT: [redacted] Progress Review Meeting, 19 Nov 64 - PAR 207, Definitive Study of Contact Printers

25X1 VISITOR: [redacted]

CONTRACTOR PERSONNEL: [redacted] 25X1

25X1 [redacted]

1. PAR progress activities were summarized covering:

a. Evaluation of measuring tools.

b. Use of high, low and medium contact test targets.

c. Half-tone screen masters.

2. Discussion on knife-edge-targets and Moire' patterns are covered in body of the subject reports under paragraph 8, 10b and 11k.

3. Rough drafts on briefing aids are to be sent to [redacted] 25X1 for approval prior to start of art work.

ACTION ITEM

4. Customer to obtain knife-edge-targets and schedule meeting.

5. Contractor to forward Moire' pattern prints and discussion of preparation.

25X1

MONTHLY REPORT

[redacted]

25X1

PAR 207
30 Oct 64

SUBJECT: Definitive Study of Contact Printers

TASK/PROBLEM

1. Conduct a comprehensive evaluation of existing contact printers, i.e., flat bed, step and repeat, and drum platen (continuous types). Primary objective is to determine printer and/or techniques that will provide maximum fidelity of duplication.

DISCUSSION

2. Experimental effort this month has centered around two measuring criteria. The relationship between high, medium, and low contrast resolution readings is being investigated, as is the effect of exposure level on the apparent resolution. These factors have apparently not been well documented heretofore.

3. Local and overall distortion as evidenced by Moire' patterns is now being experimentally tested. Some difficulty is being encountered in producing film copies from the glass master halftone plates to use as working masters for the continuous printer. A suitable means is also being sought for preparing photographic or manual reproduction of the resultant Moire' patterns, for possible inclusion in reports or test procedures as well as for the actual distortion calculations.

4. Briefing aids, mentioned last month, are nearing completion.

PLANNED ACTIVITIES

5. It is anticipated that a good deal of experimental Moire' data will be generated in the ensuing weeks. Refinement of our handling techniques may be necessary to achieve the necessary precision.

MONTHLY REPORT

[redacted]

PAR 207

2 Oct 64

SUBJECT: Definitive Study of Contact Printers

TASK/PROBLEM

1. Conduct a comprehensive evaluation of existing contact printers, i.e., flat bed, step and repeat, and drum platen (continuous types). Primary objective is to determine printers and/or techniques that will provide maximum fidelity of duplication.

DISCUSSION

2. Briefing aids, illustrating the basic features of Moiré patterns, are in preparation. Included will be the feature of current interest: the use of halftone screens to locate and measure distortion. Other illustrations are included to provide basic understanding of the subject. These aids should be available for inspection prior to the next period report.

3. A new set of 300 line/inch halftone screen masters on glass plates were prepared for the Moiré pattern study. Further "masters" on Estar film base will be generated from the glass plates after the plates have been fully checked. The resulting Estar halftone film screens must be used in the actual experimental printer study with periodic cross-checking against the glass plates.

4. Severe restrictions imposed by the high accuracy requirements (.002 percent) are among the major problems in the investigation. This is because non-rigid materials, in this case Estar film, must be used in printer evaluation work. Most non-rigid materials have inherent dimensional variability to a greater extent than a rigid material such as glass. Close attention to conditions of test environment such as temperature and humidity are needed to minimize dimensional variability problems.

5. Work on sharp-edge and resolution targets has been held in abeyance this period. Since evaluation of recently prepared targets disclosed no significant improvements in distortion measurement, it was decided to push efforts on Moiré patterns to the point where better comparison of the two methods was possible.

PLANNED ACTIVITIES

6. Complete the evaluation checks on the new 300 line/inch halftones and generate duplicates on Estar film base when these checks indicate the required accuracy has been achieved.

7. Continue studies per the outline established in the previous quarter to include both the Moiré pattern and test target techniques.

8. Follow-up the briefing aids now in preparation and advise of their status in the next report.

[redacted]

25X1

[redacted]

PAR 207

8 Sept 64

SUBJECT: Definitive Study of Contact Printers

TASK/PROBLEM

1. Conduct a comprehensive evaluation of existing contact printers (i.e., flat bed, step and repeat and drum platen (continuous types). Primary objective is to determine printers and/or techniques that will provide maximum fidelity of duplication.

DISCUSSION

2. Four series of resolution test targets were prepared. Each series included the low, medium, and high level of contrast.

3. These targets were evaluated in order to discount minor imperfections properly, before the actual duplication tests. Sharp-edge targets have not yet achieved the perfection required; accuracy to within .002 percent is necessary.

4. As of 4 August 1964 activity has centered around the type and quality of targets necessary for the testing or specification of distortion. Because of the theoretically highly precise reproduction, of which some present-day printers are capable, some difficulty is being encountered in the preparation of satisfactory test targets. Need for more accuracy in the target itself is emphasized.

5. Study of Moire' patterns as a means of evaluating distortion was started. This method appears to have some advantage over the use of a sharp-edge target. If Moire' patterns can be used successfully, there is a possibility of simpler and less expensive measurement and location of random distortion. This is partly because such patterns can be made to cover the full area of images under study. However, both methods require further study.

6. Further investigation of the use of Moire' patterns for evaluating distortion disclosed that while very small local distortions can be readily found and evaluated, uniform over-all distortions in wide film pose a special problem. Registration of the original halftone test object with the test print from it, to an accuracy of approximately .002 percent or less, requires special techniques when dealing with nine-inch wide formats. Adaptations of these techniques to our special requirements were placed under investigation.

7. One set of 300-line per inch halftones on hand, to be used for the Moire' technique for distortion measurement, was found too inaccurate for our needs. Another set is being prepared which will be 300-lines per inch also, and should be ready for evaluation in two or three weeks. As noted, a similar problem of accuracy was encountered with the sharp-edge targets, but it is hoped this, too, will be resolved shortly.

8. About midway of this quarter, a detailed outline was prepared to cover the major areas specified for the project. The outline is intended as a guide for efficient investigation and covers:

a. Comparison of equipment and materials.

b. Quality factors to be considered for measurement of the end products, such as processing effects and imagery.

c. The control of the system for uniformity and reproducibility.

PLANNED ACTIVITIES

9. Solve the accuracy problem for sharp-edge targets.

10. Complete the preparation of more accurate halftones for Moire' pattern study.

11. Proceed to other phases of the task of printer evaluation.

SECRET

MONTHLY REPORT

[redacted]

25X1

PAR 207

7 August 1964

SUBJECT: Definitive Study of Contact Printers

TASK/PROBLEM

1. Conduct a comprehensive evaluation of existing contact printers, i.e., flat bed, step and repeat, and drum platen (continuous types). Primary objective is to determine printer and/or techniques that will provide maximum fidelity of duplication.

DISCUSSION

2. Evaluation of high, low, and medium contrast resolution targets is continuing. Sharp-edge targets for edge-effect and possiblty distortion studies are being prepared but have not yet achieved the perfection required; accuracy to with .002% is necessary.

3. Further investigation of the use of Moire' patterns for evaluating distortion has disclosed that while very small local distortions can be readily found and evaluated, uniform over-all distortions in wide film pose a special problem. Registration of the original half-tone test object with the test print from it, to an accuracy of approximately .002% or less, requires special techniques when dealing with nine-inch wide formats. Adaptations of these techniques to our special requirements are being investigated.

4. A detailed outline covering all aspects of the entire task has been prepared as a guide for efficient use of all investigative efforts. Areas covered for study:

a. Printer (s) to be used for quality measurement.

b. Film base materials for use with duplicating emulsions to include:
   (1) Strength
   (2) Stability (Dimensional)
   (3) Resistance to contamination and damage.

c. Emulsion characteristics.

d. Processing capability and effects.

e. Imagery measurements.

f. Measuring devices and/or services available.

g. Printer uniformity and system reproducibility obtainable within control limitations of above factors.

PLANNED ACTIVITIES

5. Investigation of the three types of test targets discussed above will be continued, and actual use of the targets initiated as quickly as possible.

6. Briefing aids will be prepared to cover the major phases of this project.

SECRET

George

MONTHLY REPORT

[redacted]

25X1

PAR 207

10 July 1964

SUBJECT: Definitive Study of Contact Printers

TASK/PROBLEM

1. Conduct a comprehensive evaluation of existing contact printers (i.e., flat bed, step and repeat, and drum platen (Continuous) types). Primary objective is to determine printer and/or techniques that will provide maximum fidelity of duplication.

DISCUSSION

2. As part of the original study plan, four series of resolution test targets have been prepared. Each of these include the low, medium, and high contrast level. These are being checked so that minor imperfections can be properly discounted as actual duplication tests are performed.

3. The use of Moire' patterns as a means of evaluating distortion is being investigated. This method appears to have some advantage over the use of a sharp edge target. If Moire' patterns can be used successfully, there is a possibility of simpler and less expensive measurement and location of random distortion. This is partly because such patterns can be made to cover the full area of images under study. However, both methods require further study.

PLANNED ACTIVITY

4. Continue material properties investigation and make processing checks in accordance with the study plan.

SECRET

PAR-207

See PAR-206 "Quarterly Review Conference" dated 26 June 64

Approved For Release 2005/05/02 : CIA-RDP78B04770A002100100002-7

SECRET

MONTHLY REPORT

25X1

PAR 207

5 June 1964

SUBJECT: Definitive Study of Contact Printers

TASK/PROBLEM

1. Conduct a comprehensive evaluation of existing contact printers (i.e., flat bed, step and repeat and drum platen (continuous types). Primary objective is to determine printers and/or techniques that will provide maximum fidelity of duplication.

DISCUSSION

2. A comprehensive study plan outline was prepared to cover:

a. Literature survey of parameters for imagery, distortion and uniformity.

b. Experimental examination of these parameters on the Goldberg and Niagara printers, including type and repeatability of measurements.

c. Examination of material properties required for parameter testing. Include dimensional stability, optics, spectral sensitivity and items in 2a above.

d. Environmental conditions such as cleanliness, temperature, and humidity.

3. The study plan was followed to begin the preparation of test targets for measurement of imagery parameters.

a. Resolution Targets: Low, medium, and high contrast loops are being made so that multiple readings may be recorded at edge and center areas of the format.

b. Sharp Edge Target: The use of a sharp edge target is being investigated for evaluating printer sharpness. This same target may also provide calibration marks for distortion measurements.

4. Based on initial analysis of requirements, the following parameters are being assessed as suitable means of evaluating printer output quality.

a. Resolution - Printer quality to be determined by analysis of the low, medium, and high contrast targets.

SECRET

SECRET

b. Edge Trace - The use of a sharp edge target is being investigated per 3b above and also for distortion as described below.

c. Distortion - The sharp edge target will be investigated as a means of providing calibration marks for distortion measurements. With suitable optical comparator equipment and environmental conditions, system distortion measurements to within .01% are anticipated.

PLANNED ACTIVITY

5. Evaluation of a printing system(s) requires that distortion and non-uniformity effects introduced by the processing system be held at a minimum to insure valid conclusions. The capabilities of available processors will be checked and the most suitable processor selected to meet the processing requirements.

6. Continue with the study plan for the examination of other material properties and conditions.

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[redacted]

SECRET

MONTHLY REPORT

[redacted]

25X1

PAR 207

1 May 64

SUBJECT: Definitive Study of Contact Printers

TASK/PROBLEM

1. Conduct a comprehensive evaluation of existing contact printers (i.e., flat bed, step and repeat and drum platen (continuous) types). Primary objective is to determine printer and/or techniques that will provide maximum fidelity of duplication.

DISCUSSION

2. A study plan has been outlined as follows:

a. Survey the literature to assess parameters in the following areas:

1. Imagery
2. Distortion
3. Uniformity

b. Experimentally examine the indicated parameters using both the Goldberg and Niagara printers. Type and repeatability of measurements will be included.

c. Examine the following properties of materials required for parameter testing:

1. Dimensional stability
2. Optical properties
3. Spectral sensitivity
4. Others, as dictated by item 2a.

SECRET

GROUP-1
Excluded from automatic downgrading and declassification

-6a-

7

d. Study the influence of the following environmental conditions upon parameter testing:

1. Cleanliness
2. Temperature
3. Humidity

PLANNED ACTIVITIES

3. It is planned to follow the study plan starting with the literature survey.

PAR 207-A

DEFINITIVE STUDY

OF

CONTACT PRINTERS

21 April 1964

Approved For Release 2005/05/02 : CIA-RDP78B04770A002100100002-7

PROJECT AUTHORIZATION REQUEST

PAR 207-A

21 Apr 64

SUBJECT: Definitive Study of Contact Printers

TASK/PROBLEM

1. Conduct a comprehensive evaluation of existing contact printers (i.e., flat bed, step and repeat and drum platen (continuous) types). Primary objective is to determine printer and/or techniques that will provide maximum fidelity of duplication.

PROPOSAL

2. It is proposed that this task be accomplished in two phases as follows:

a. Phase I - Investigation:

(1) Two state-of-the-art contact printers will be used for a study of the parameters necessary to define printer capability and quality in the specific areas of imagery, distortion and uniformity. The two printers to be used are the Goldberg (flat bed, step and repeat) and the 9.5-inch Niagara (drum platen, continuous).

(2) The environmental test conditions of cleanliness, temperature and humidity will be studied to determine levels required for satisfactory printer evaluation.

(3) The sources of inconsistency such as film slippage, mistracking and erratic contact will be examined.

(4) Various test objects and duplicating materials will be investigated for dimensional stability and duplication suitability, and the most suitable material will be selected and used as a standard in all phases of the investigation.

(5) Objective methods of analysis and testing will be used where possible, but certain tests may involve qualitative subjective analysis.

b. Phase II - Contact Printer Evaluations: Conduct evaluation of contact printers as mutually agreed between the customer and the contractor using techniques, procedures, and criteria established in the Phase I investigation. Where necessary breadboards will be fabricated as required to accomplish investigation.

PROGRAM OBJECTIVE

3. Phase I - Investigation: A final report that will discuss in detail printer types, materials, techniques, instruments, environment, procedures, and criteria necessary for satisfactory contact printer evaluation.

4. Phase II - Contact Printer Evaluation: Conduct evaluation of contact printers in accordance with the procedures and criteria established in Phase I and only on contact printers as agreed by the customer and the contractor at the time of proposal request.

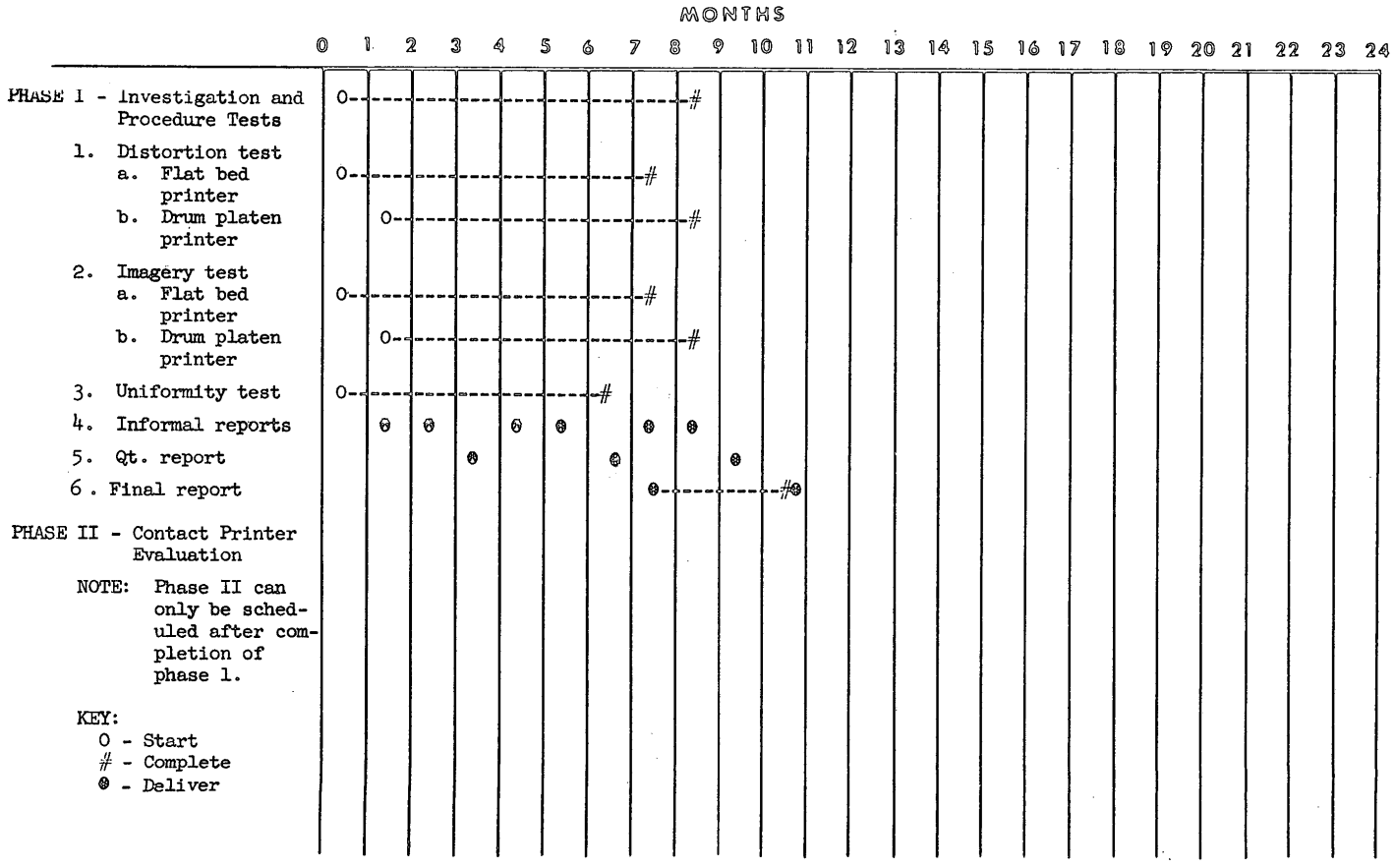
SCHEDULE

5. A tentative schedule covering Phase I effort is shown in Fig. 1. Schedule(s) for evaluation of contact printer(s) can only be furnished after the completion of Phase I and determination of specific customer requirements.

TENTATIVE SCHEDULE

DEFINITIVE STUDY OF CONTACT PRINTERS

PAR 207-A
21 Apr 64



STUDY PROGRAM OBJECTIVE

Definitive Study of Contact Printers (PAR-207)

Problem

This PAR resulted from a request to provide a study and make intercomparisons of the techniques of contact printing. At the time of the request we were also asked specifically to provide, upon the basis of our present experience, an immediate recommendation of the "best" method for printing black and white films in roll form. The recommendation was given in our "Preliminary Report on Study of Contact Printers" dated 11 October 1963.

From this preliminary exercise we recognize that there may be at least three separate requirements for contact prints:

1. Multiple copies of relatively long rolls for general P.I. use.
2. Exploitation prints, i.e., multiple copies of single frames.
3. T.I. mensuration prints.

Each of these may well have distinctive requirements for the "best" output.

Proposal

If so instructed we would propose to analyze these requirements from both the theoretical and practical standpoint and to confirm our conclusions by tests where feasible. This may, in some cases, involve the construction of simple breadboards or temporary modification of existing equipment in the case of dynamic printing.

For example, our preliminary report indicated that we felt that the inherent distortion of a drum-type printer (caused by bending the film) could be offset by proper tension control. Simple tests involving different widths of identical negative material and a fixed width of raw stock run at a fixed tension could demonstrate the basic principle since the tension per unit of negative width would vary. The next step would be to breadboard a precise tension control device onto a standard printer and run tests.

In evaluation of these tests we would require assistance in the field of precise distortion measurements in the range of hundredths of one percent. We do not have this inhouse capability, but since it does exist elsewhere in the community, we propose to submit the test materials to such a group for evaluation.

In the case of static printers we would propose to test various systems with identical high quality targets presently available at 80 to 800 lines/mm, and with similar light sources, processing and examining procedures. Printers, such as vacuum frame cut sheet, simple air bag, air bag with internal roller squeegee, etc., would be included in the comparison.

Evaluation of various systems would be on the basis of the following criteria:

1. Resolution
2. Cleanliness
3. Distortion
4. Output Rate
5. Ease of Operation
6. Maintenance

Until our preliminary report cited above is evaluated, we do not propose to proceed further. If so instructed, we will institute the above studies or any others that may be directed.

Approved For Release 2005/05/02 : CIA-RDP78B04770A002100100002-7

PRELIMINARY REPORT

ON

"STUDY OF CONTACT PRINTERS"

(PAR 207, [redacted]

9 October 1963

TABLE OF CONTENTS

DIAGRAMS

PRELIMINARY REPORT ON

"STUDY OF CONTACT PRINTERS"

(PAR 207)

Abstract

This report contains a recommendation and a qualitative summary of supporting experience for the "best" form of contact printer for black and white film in roll form for P.I. use. The performance of a drum type printer in an existing design appears well balanced with the resolution and distortion characteristics of machine processed Type 8430 print film. Design approaches to provide compensation for the small print image distortion produced by bending the films over a drum are suggested.

PRELIMINARY REPORT ON

"STUDY OF CONTACT PRINTERS"

(PAR 207)

1. Requirements

As a part of the project to provide a "Definative Study of Contact Printers" as described in PAR 207, we were asked to provide a statement of our opinion based upon experience to date of what constitutes the "best" form of contact printer which will:

1. Print only black and white film in roll form.
2. Provide no contrast or image enhancement controls beyond overall exposure level adjustment.
3. Provide maximum possible resolution.
4. Introduce the minimum possible distortion.

The staff in our organization concerned variously with printer design, maintainance, quality control and use were asked to comment and provide data and suggestions on the subject. This report summarizes their contributions.

2. The Design Problems

The design problems in a printer to meet the above requirements may be classified into four areas.

2.1 Provide "Micro-Contact". The emulsion surface of the original film and the print stock emulsions must not be separated by more than a few microns. In achieving this surface proximity the effective viscosity of a thin air layer and the elimination

2.1 Provide "Micro-Contact". (Cont'd)

of dust particles are the major problems. Section 3 discusses our experience on this problem in considerable detail.

2.2 Provide Minimum Distortion. In the ideal case the two films are laid together in a flat plane, each completely free of any stress as they are brought into contact for the printing exposure. Practically this requirement is not completely compatible with the need for complete removal of the air layer and freedom from dust. Therefore, compromises are in order as also discussed in Section 3.

2.3 The Light Source. The geometry and spectral quality of the light source can have considerable effect upon the resolution obtained in the print. These problems are discussed in Section 4.

2.4 Convenient Operation. In addition to the basic problems mentioned above the printer must provide safe, convenient handling of the original and of the print stock, be easily operated for the printing jobs to be done, and be free of maintenance problems.

3. Methods of Producing "Micro-Contact"

In designing, testing and using printers we have worked with a wide variety of arrangements to place the film in close contact. Each arrangement has certain advantages relative to others in meeting the three way requirement to;

1. remove the air layer,
2. eliminate dust particles, and
3. eliminate distortion.

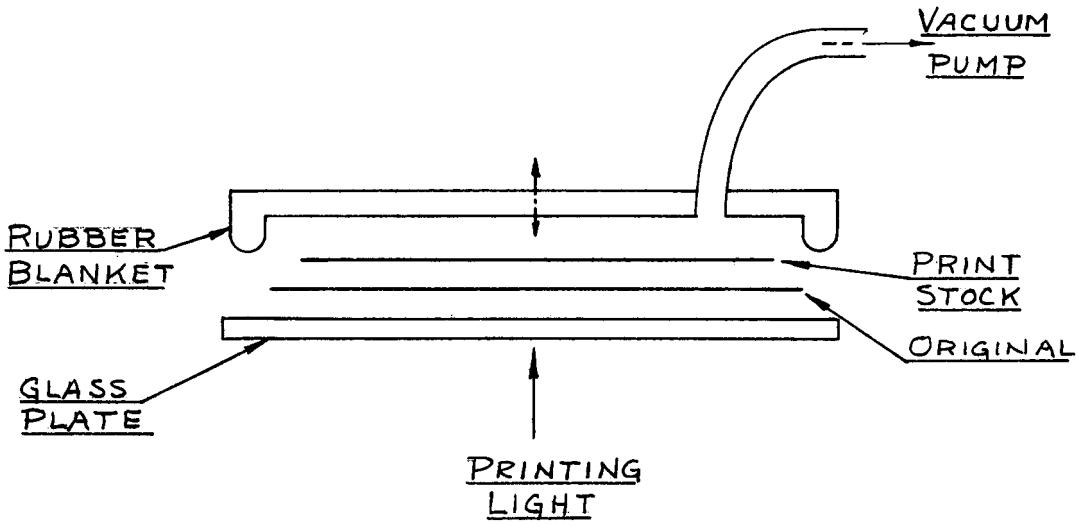
3. Methods of Producing "Micro-Contact". (Cont'd)

It will be useful to explore several of these in some detail including two printers in production use.

3.1 Vacuum Frames. (Figure 1A & 1B) For exposing cut sheets of print stock from cut sheets of original film the vacuum frame has been the standard of maximum quality. Two arrangements for producing contact by the use of vacuum are familiar to us, as illustrated in Figure 1A and Figure 1B. In these arrangements atmospheric pressure (up to 15 psi) forces the air from between the print stock and the original.

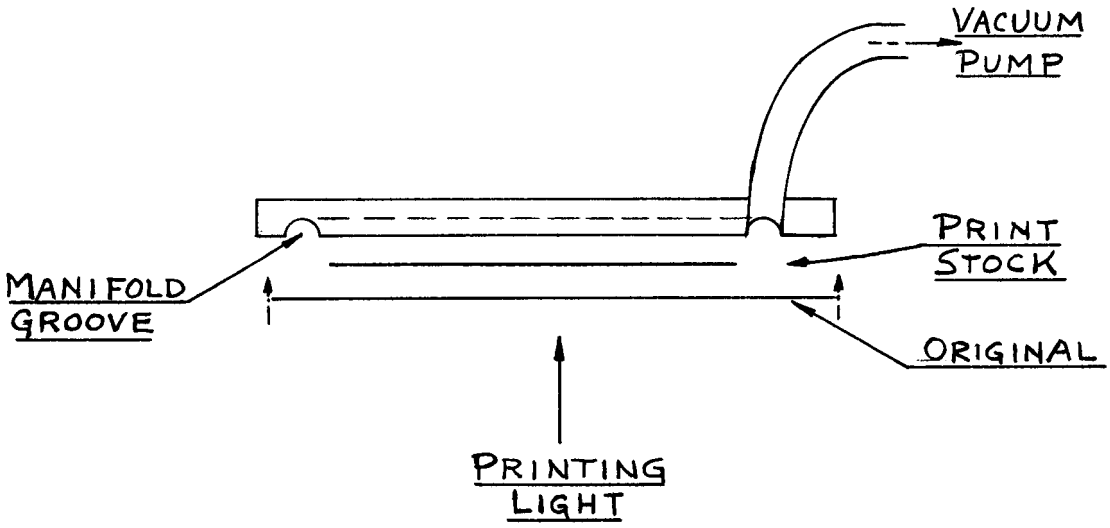
By watching the light interference patterns (Newton's Rings) between the two films (and between the glass and the base of the original in Figure 1A) for a period of several seconds one is impressed by the slowness with which the films settle into best contact. The process can be hastened by rubbing one's hand or by running a roller across the contact area. These conditions illustrate the effectively high viscosity of the thin air layer and the relatively small component of force moving the residual air out of the area. The Newton's Ring patterns will probably also show a few specks of dirt in the area. Particles too small to produce noticeable clear spots in the image can separate the emulsion surfaces enough to produce loss of resolution.

Vacuum frame printing, given adequate time for the films to settle into contact (or some help with a squeegee roller) and cleanliness of the contact surfaces, can produce the ultimate degree of contact. However, our experience in using it as a laboratory tool is that the films as installed in the printing frame are not clean enough to avoid erratic results for solutions in the range of 300 l/mm and over.



VACUUM FRAME WITH GLASS

FIG. 1A



VACUUM FRAME WITHOUT GLASS

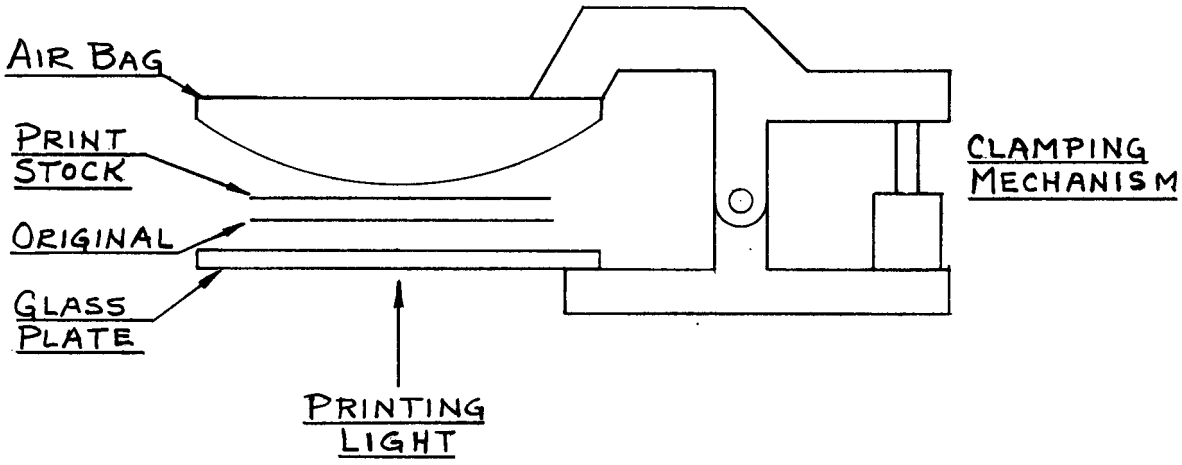
FIG. 1B

3.2 Air Bag Printer. (Figure 2) The Air Bag Printer provides better convenience than the vacuum frame for handling originals and print stock in roll form. The rounded form of the air bag by applying pressure first at the center of the printing gate and then in a progression radially outward has some effect of sweeping the air from between the films. Since the films are mechanically clamped between the air bag and the glass plate the strength factors in the printer frame work and the glass plate limit the pressure which can be used. In our experience with a 9" x 18" modified "Morse" printer improved resolution is obtained by increasing the air bag pressure (as measured with the gate closed) up to the 2 to 3 psi limit imposed by the strength of the 3/8" thick platen glass.

With this printer we achieve consistently 300 l/mm (or better) resolution. Cleanliness and Newton's Ring patterns are problems for most laboratories with less than ultra-clean facilities. Movement of the films and of the platen (air bag) generates static electricity and stirs up dust in the gate area which is then attracted to the film surfaces. The films are also stationary outside the gate for sometime allowing dust to settle upon them. Considerable dirt is transferred to and accumulates on the glass plate, causing clear spots to appear on each subsequent frame printed.

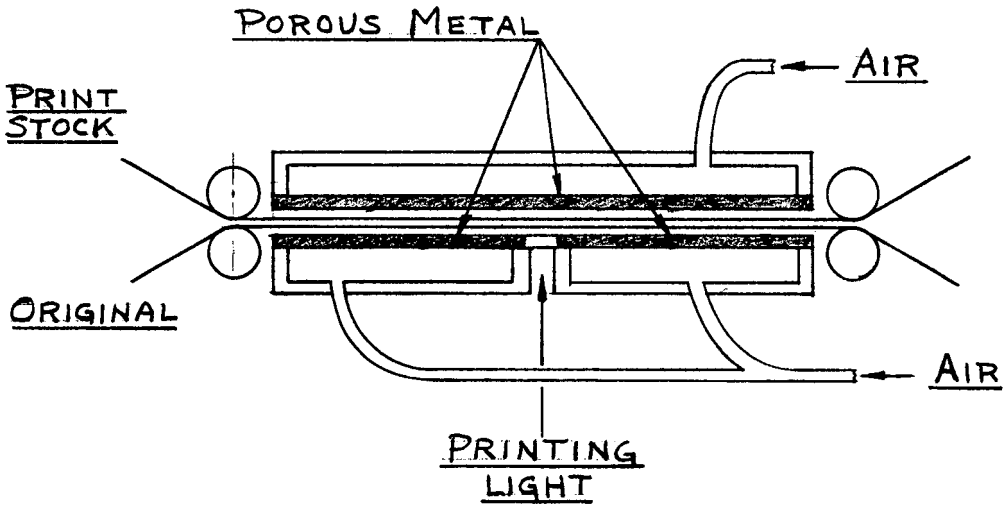
Newton's Rings are formed between the glass plate and the original film in addition to the film to film contact.

In general, we feel this printer;



AIR BAG PRINTER

FIG. 2



POROUS METAL AIR PRESSURE GATE

FIG. 3

3.2 Air Bag Printer. (Cont'd.)

(1) does an acceptable job with regard to resolution,

(2) is difficult to keep clean,

(3) is slow because of the intermittent nature of the operation cycle, and

(4) provides the minimum dimensional distortion of the print.

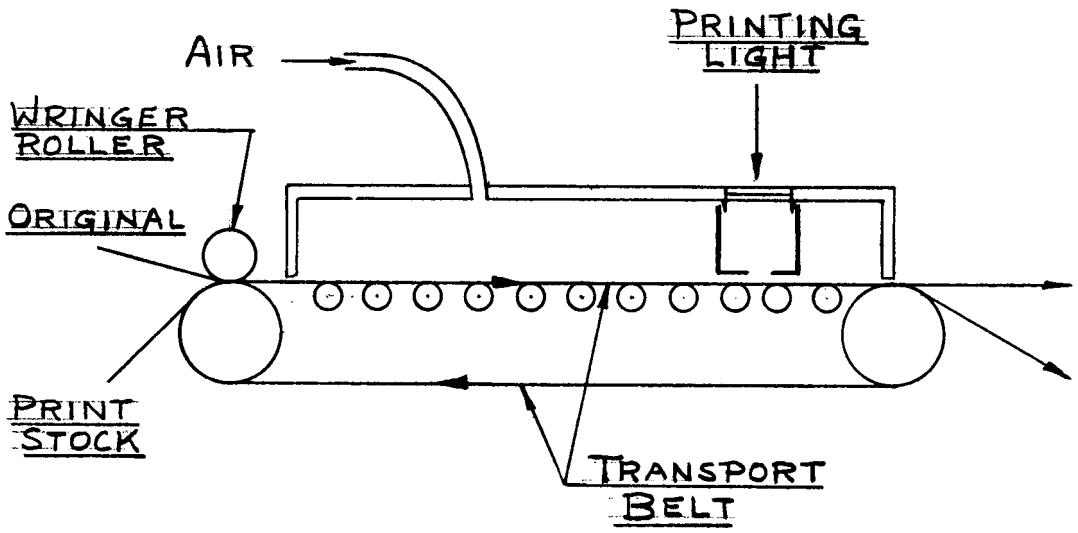
3.3 Dynamic Air Gate Systems. Over the past three years we have conducted experiments and built one prototype of systems using air support for moving films in a flat plane past a stationary printing slit. (Flat gate, air support, continuous printers.)

3.3.1 The Porous Metal Air Pressure Gate. (Figure 3)

In this experiment the films were placed between two porous metal plates through which air is being forced under pressure. The air cushions thus generated permit the films to move freely past the printing slit and presses them into contact. At any reasonable transport speed we found that the films did not consistently come into close enough contact to produce resolution equal to that obtained in other methods of continuous printing then available.

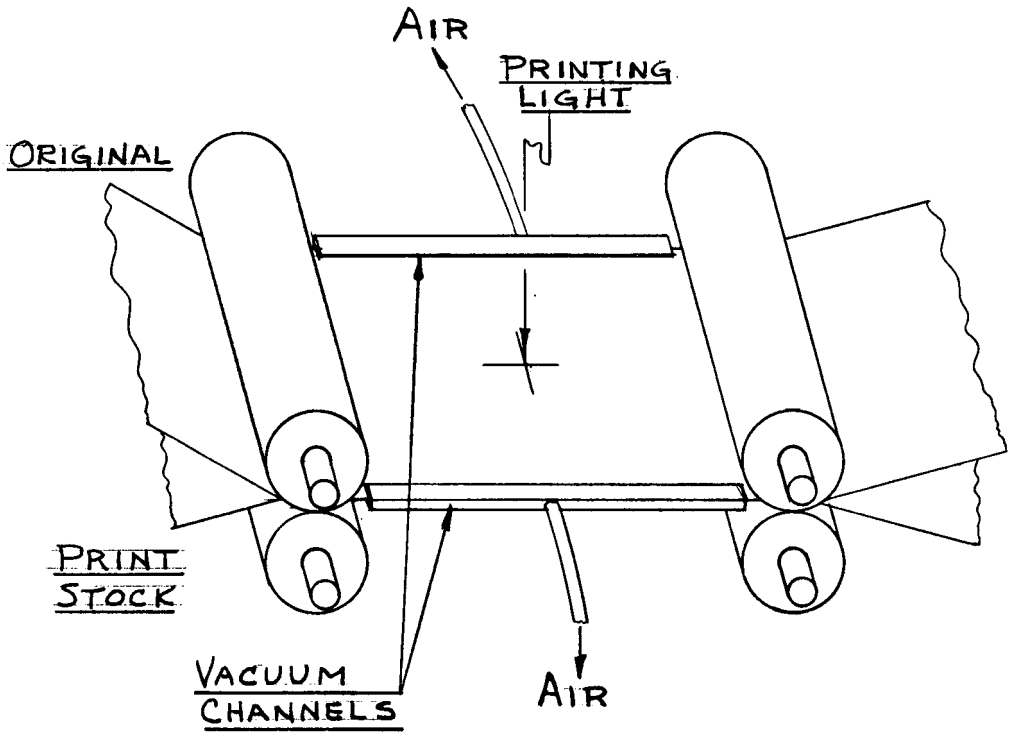
3.3.2 Pressurized Air Bell Gate. (Figure 4)

In this arrangement, transport of the films past the exposing slit was accomplished by a roller supported conveyor belt while the films were held in contact by the air pressure inside an air bell having narrow slit



PRESSURIZED AIR BELL GATE

FIG. 4



VACUUM CHANNEL GATE

FIG. 5

3.3.2 Pressurized Air Bell Gate. (Figure 4) (Cont'd.)

clearance between its lower edges and the surface of the original film. The breadboard test of this system used a flat platen on a reciprocating slide instead of the continuous belt.

It is difficult to judge the resolution capability of this system since the targets available at the time of this test were not as high in quality as our present ones. At 180 to 200 l/mm, the prints from this system appeared better than those made on the production printer then in use.

The noise and the disturbing effect of the "air jet" around the bottom of the air bell, plus the expected mechanical problems of the conveyor belt film backing, made it an unattractive design. Since the vacuum channel system described in paragraph 3.3.3, also being tested in breadboard form at the same time had equal resolution, the Air Bell Gate was abandoned.

3.3.3 Vacuum Channel Gate. (Figure 5)

In this arrangement the films are moved through two successive pairs of soft wringer rolls. Along each edge of the films between the two pairs of rolls is a C-section channel bridging around the edge of the films with a narrow slit between the films and the edge of the channel. These channels are connected to a vacuum pump to maintain pressure below ambient at the edge of the film to prevent separation of the films after being

3.3.3 Vacuum Channel Gate. (Figure 5) (Cont'd.)

squeegeed together by the first pair of rolls. The print exposure is made in the area enclosed by the rolls and the vacuum channels.

The breadboard model of this system worked well and a prototype production printer was built as the "LDHR Printer". This printer uses a tungsten lamp to expose type 8430 film and has achieved 300 to 400 lines per mm near the center of the films but intermittently falls as low as 80 lines/mm near the edge of 8" & 9-1/2" film. It now appears that higher resolution could have been achieved with a mercury arc source. The intermittent loss of resolution appears to result from a combination of the following conditions;

a. The "Dynamic Vacuum" system does not appear able to cope with edge curl in the films. In fact, there may be a tendency for the high velocity air flow past the outside surface of each of the two films to separate the films at the edges.

b. Wide, thin base film tends to wrinkle between the pairs of rolls, breaking the contact locally.

c. The vacuum pump and air lines have insufficient capacity to produce an adequate pressure differential in the channel when it is opened far enough to pass splices.

3.3.3 Vacuum Channel Gate. (Cont'd)

Another problem in this printer has been in tracking errors greater than those permissible for keeping the edges of the films aligned within the vacuum channels. The print is not exposed on the edge inside the vacuum channel, hence the channel overlap must be as small as possible.

Further development work could probably make this printer suitable for production use. However, we were unable to demonstrate a measureable decrease in print distortion in comparison to drum printers in current use (both are less than 0.1%) and this instrument is;

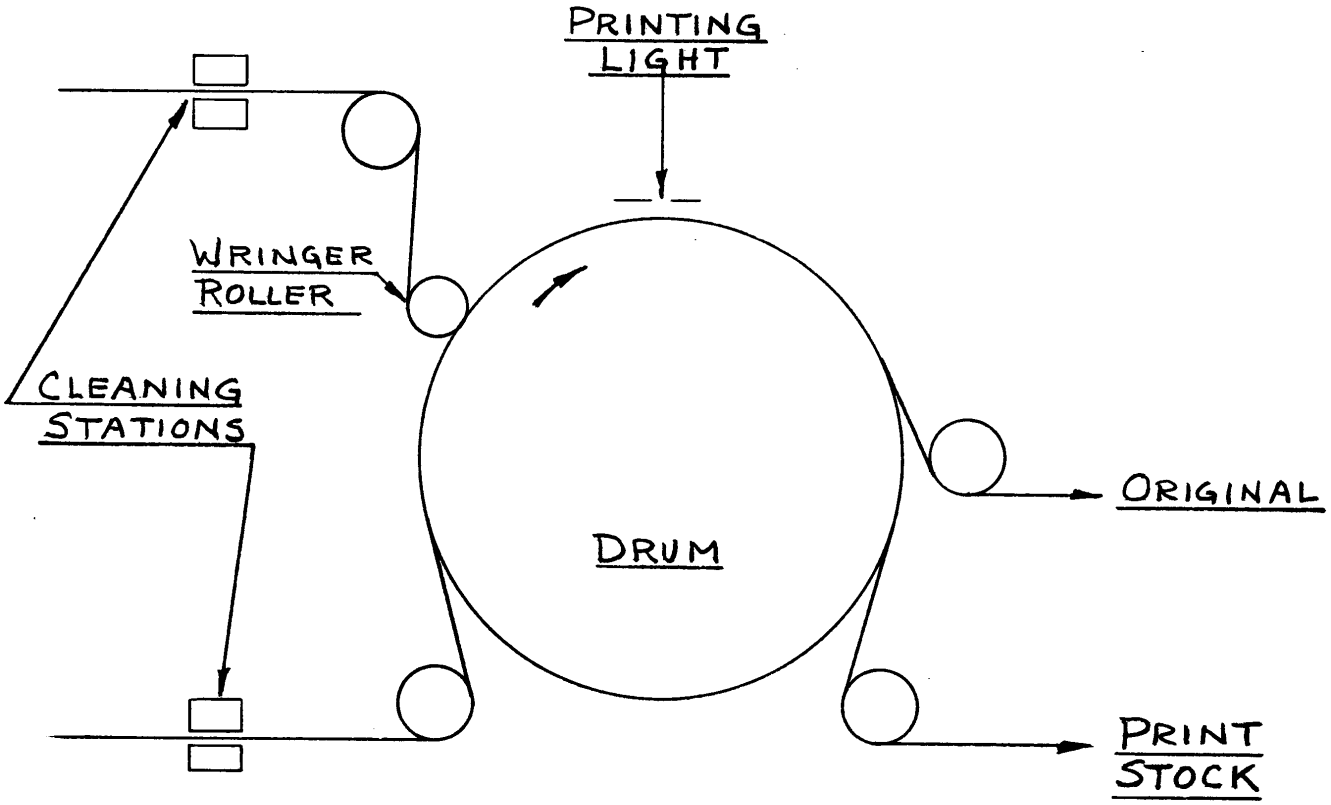
a. More difficult to use, and

b. more expensive to build.

The prototype is being used to support experimental work in our lab, but we are not recommending fabrication of additional units of this type. A final report on this project is in preparation.

3.4 The Drum Printer. (Figure 6)

In this design the two films are placed upon a large diameter smooth surface metal drum to run at a constant speed beneath a printing slit. The arrangement is shown in Figure 6. The wringer roll has a resilient surface and presses against the films and the drum with several pounds force. Thus the two films are "wrung" together as they pass under this roll at high unit pressure,



THE NIAGARA PRINTER

FIG. 6

effectively removing the air between them.

Several factors work together to avoid separation of the film surfaces after they leave the wringer roll until they have passed the printing light slit.

1. The tension in the film webs as they are wrapped about the cylindrical drum surface produces a pressure component toward the drum surface of 0.1 to 0.5 psi.
2. The bending of the films into cylindrical form, even without the drum support, removes most of the tendency for edge curling.
3. The firm support surface under the films eliminates "flutter" effects (as in air support gates) which tend to separate the films.
4. The films progress from the wringer roll to the point of separation with a completely static relationship to each other and to the drum surface.

These factors appear to provide closeness of contact between the two films at the moment of exposure equal to that possible with a vacuum frame. This quality of contact has been preserved in tests made at transport speeds up to 120feet/minute.

To reduce the amount of dirt between the films, cleaning stations are placed on the film ahead of the printing station. Since the films move only in their

own plane there is little disturbance of the air about the printer to stir up dust. A given point on the film passes between the cleaning station and the printing station in only 2 or 3 seconds, so there is little opportunity for dust to settle upon the film after it is cleaned.

We find that with the high pressure mercury arc source we obtain no less than 350 l/mm and in some cases have observed over 500 l/mm in prints on Type 8430 film.

In bending the print stock emulsion-out upon the drum a longitudinal shortening of the image on the print is produced. It can be demonstrated that the ratio of the change-of-image-length to the image-length-on-the-original due to bending only is approximately equal to the ratio of the total-thickness-of-the-two-films to the drum-diameter. With a 12 inch diameter drum and two 6 mil films this amounts to 0.1% image shortening.

If the web tensions on the printer are such that the original film is stretched more than the print stock it provides compensation for the above effect. For example, in printing from thin base Estar original (Type 4404) to standard base triacetate print stock (Type 8430) with 0.5 pound per inch of film width tension the above image shortening effect is reduced to about 0.03%.

The measured shrinkage of test prints on Type 8430 print film exposed on this drum printer and machine processed has been less than 0.1%. For test prints

on SO117 (7 mil Estar support) and otherwise handled in the same manner the measured shrinkage has been about 0.05%. The image distortion generated by the printer is not separable in our tests from that produced by the processing of the print.

Our evaluation of this type printer may be summarized as;

1. It provides the maximum resolution available in any printer of our knowledge and does it consistently.
2. Cleanliness of prints is excellent,
3. Dependability is good, and
4. Dimensional distortion is comparable to that encountered in machine processing of film.

4. The Printer Light Source.

It has been demonstrated that increased definition (and resolution) are obtained by using specular illumination for print exposure. For the resolution levels achieved on the drum printer detectable reduction of resolution is found for sources larger than about 5°.

Recent experiments have indicated the printing light should not include any wave-lengths which are not strongly absorbed in the print stock emulsion. Light which is not strongly absorbed but which can expose the emulsion is scattered through the emulsion around the point of entry before it produces exposure, thus reducing the image sharpness.

5. Recommendation.

Because of the excellent resolution, cleanliness, efficiency and dependable operation obtained in the drum type printer we strongly

recommend this approach for the usage indicated in Section 1. The performance of the present design (Niagara) seems well balanced with that of Type 8430 print film.

For applications in which lower distortion can be profitably utilized, further development of the drum printer system would be profitable.

1. A printer with a 30" diameter drum is quite feasible and would reduce the distortion due to bending by 60% as compared to a 12" diameter drum. (To 0.04% for two 6 mil films)

2. Refinement of the tension controls on the film can be done with proven mechanisms. (Looper rolls and servo control of spindle torques.) As suggested in Section 3.4, tensioning of the film to stretch the original film more than the print stock can compensate for the distortion due to bending the film over the drum.

APPENDIX

Relative Characteristics of Roll Film Printers

Printer Type (1)	Volume of Output	Print Resolution	Cleanliness	Lack of Distortion	Flexibility (Various Widths)	Ease of Use
1. Vacuum Frame	Low	High	Low	High	---	---
2. Air Bag Printer	Med.	Med.	Med.	High	High	High
3. Dynamic Air Gate Printers	High	Erratic	High	High	Low	Med.
4. Drum Printer	High	High	High	Med.	High	High

(1) Not adaptable to roll film printing as described here. It is included for comparison purposes only.

discusses modulation transfer function as a criteria for quality but no such evaluations were made

Resolution is supported even though the accuracy of the results are open to question

Knife edge is not a true criteria of quality but can be used for comparison

Much of the information is common knowledge

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26 January 1965

5X1

[redacted] - ACTIVE PAR TITLES AND PROPOSED CONDENSED TITLES

PAR	Title	Proposed Condensed Title*
202	Briefing Print Enlarger	Same as title.
203	Rapid Access Printer	Same as title.
206	Reversal Processing of High-Resolution Films Study	Reversal Processing Study
207	Definitive Study of Contact Printers	Contact Printer Study ✓
21[redacted]	Microdensitometer Study of Effects of Processing	Image Effects Study
212	Color Acquisition System Review Study	Color Acquisition Study
213	Color Reproduction Systems Review	Color Duplication Study
214	Roller Transport Reversal Processor (12-Inch)	Reversal Processor RT-12
215	Roller Transport Processor (24-Inch)	Processor RT-24
216	Exposure of Photographic Material with Lasers	Laser Photographic Exposure
217	Optimization of Lasers	Same as title.
222	Stereo Registration Systems	Stereo Registration System
223	Monochromatic Lens System	Monochromatic Lenses
224	3X - 15X Fluid Gate Enlarger	Fluid Gate Enlarger
225	Microdensitometer Training Program	Microdensitometer Training
22[redacted]	Analysis of Photographic Images to Evaluate System Performance	Photographic Image Analysis

*Condensed titles are to contain a maximum of 30 characters including spaces.

PAR-207 "Definitive Study of Contact Printer"

2d Qtr Report: Study Objectives submitted.

Estimated Factory Cost [redacted] 25X

31 Jan 64: See MFR, this date, regarding reorienting the Study Objectives

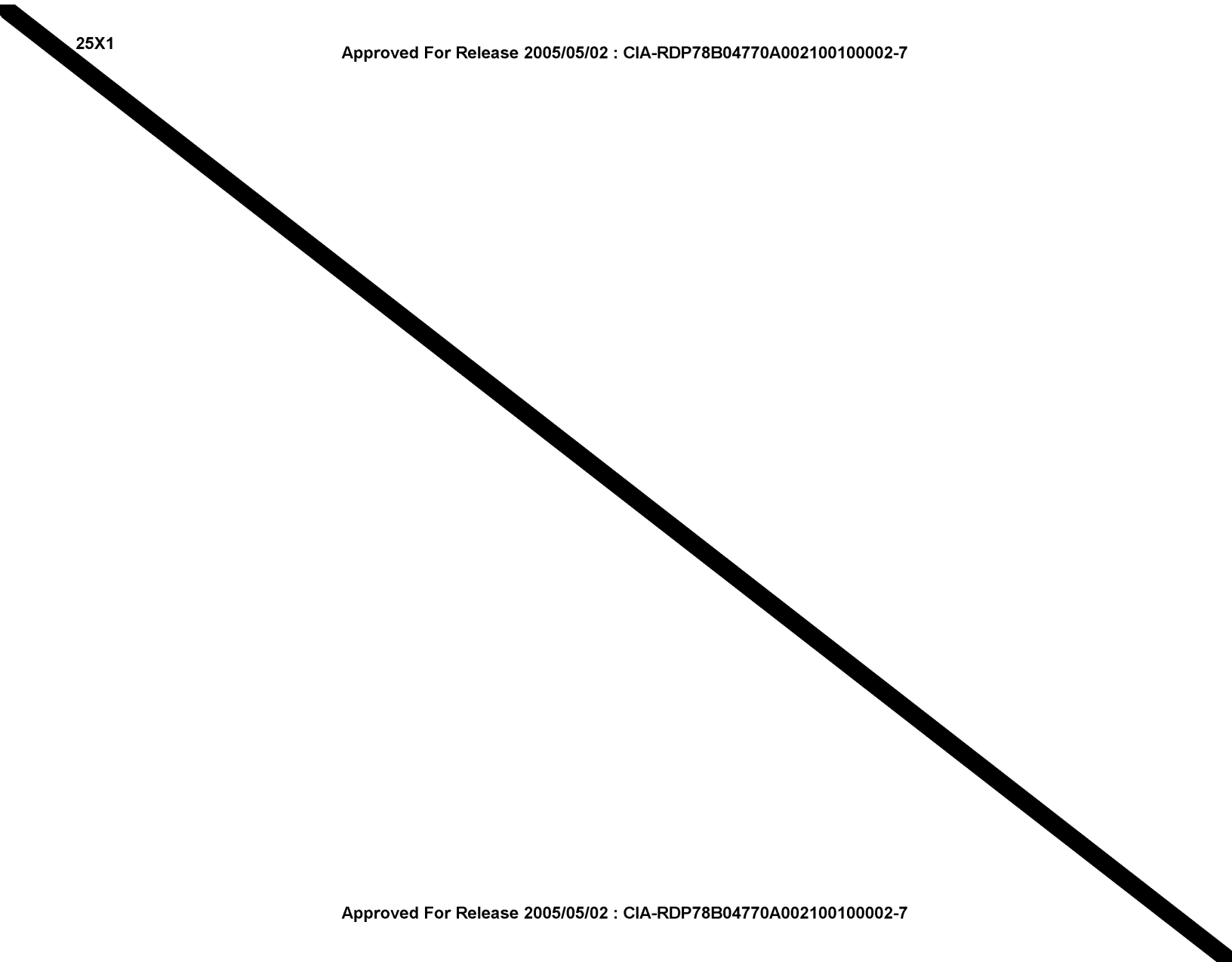
25X1 3-4 Feb 64: [redacted] will write a revised PAR.

5 Feb 64: See message, this date, [redacted] to submit a 25X1
revised program.

20 Feb 64: Message of the Lab reschedules delivery of tech. obj's. on 16 March '64.

27 Apr 64: PAR-207-A secured

19 mar Picked up 4 each glass halftone plates plus 2 films made from master. Those were turned over to [redacted] for 25X1
evaluation.



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